REMARKS

Applicant respectfully requests allowance of the subject application. Claims 1-54 are pending. Claims 1, 13, 19, 29, 37, and 45 were previously amended. In view of the following remarks, Applicant respectfully requests that the rejections be withdrawn and the application be forwarded along to issuance

§§ 102(e) and 103 Rejections

Claims 1-3, 5 and 6 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,953,431 to Yashima et al. (hereinafter "Yashima"). Claims 29, 30, 32, 37-41, 45, 50 and 51 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,252,968 to Narasimhan et al. (hereinafter "Narasimhan"). Claims 4, 7, and 8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of U.S. Patent No. 5,305,388 to Konno et al. (hereinafter "Konno"). Claims 9 and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of U.S. Patent No. 5,815,580 to Craven et al. (hereinafter "Craven"). Claim 11 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of U.S. Patent No. 6,319,117 to Goff (hereinafter "Goff"). Claim 12 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of U.S. Patent No. 5,533,120 to Staudacher (hereinafter "Staudacher"). Claims 13-16, 18, 19, 21, 24 and 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of Narasimhan. Claims 17, 22 and 23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of Konno. Claims 26-28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of Staudacher. Claim 31 stands rejected under 35 U.S.C. § 103(a) as

being unpatentable over Narasimhan in view of Konno. Claim 34 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Craven. Claim 36 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Staudacher. Claim 33 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Konno. Claim 35 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Goff. Claim 42 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Craven. Claim 43 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Goff. Claim 44 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Staudacher. Claims 46 and 47 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Yashima. Claims 48, 49, 53 and 54 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Craven. Claim 52 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Konno.

<u>The References</u>

Yashima describes an acoustic replay device. The acoustic replay device includes a ducted horn disposed on a speaker and an audio signal processing means including a non-recursive digital filter realizing an inverse characteristic of the transfer characteristic of the ducted horn. *See Yashima, Col. 5, Lines 14-21.* With this configuration, once the characteristic of the non-recursive digital filter is set to be the inverse characteristics of the ducted horn, the acoustic radiation characteristic at the opening of the ducted horn forming the sound source for the sound field space always matches the replay characteristic of the speaker, without

regards to the type of the speaker, so that the effect of the ducted horn can be easily removed, and the acoustic signal can be radiated into the sound field space with a high fidelity, without deteriorating the characteristic of the speaker. *See Yashima, Col. 5, Lines 22-31.*

Narasimhan describes an acoustic quality enhancement via feedback and equalization for mobile multimedia systems. During a training phase, unique frequency tones are transmitted (e.g., via speakers), and then recorded (e.g., via a microphone). Each fed-back audio frequency tone is then used to estimate the gain of the reproduction medium at that particular frequency, and the background noise parameters at that frequency are also determined. This is used to construct a set of inverse filters, so the original audio source can then be pre-filtered to produce the desired audio output. During the second phase, which is the processing phase for playing back an audio source, the audio source is decomposed into sub-bands whose center frequencies are the frequency tones used for training. In each sub-band, the audio signal component is pre-emphasized by the gain estimates obtained during training, and also inverse filtered using the parameter estimates obtained during training. The resulting signal is then reconstructed into a full-band signal, resulting in an actual audio output signal that is better matched to the intended audio output. *See Narasimhan, Col. 2, Lines 32-50.*

Kunno describes a bass compensation circuit for use in a sound reproduction device. The bass compensation circuit is for use in a sound reproduction device, which can compensate a frequency response at desired frequencies of a low frequency range, which are necessary for music reproduction in such a way that the compensated frequency response can change against change in sound volume in a natural manner. *See Kunno, Col. 1, Lines 60-67.*

Craven describes compensating filters for a loudspeaker. The response of the loudspeaker is measured by placing the loudspeaker in an echo free environment, passing a test signal through the loudspeaker, and picking up the reproduced audio signal via a microphone. From the signal measured by the microphone, a suitable model of the loudspeaker response is derived. From this model, the response necessary to compensate the loudspeaker is derived; in a simple case, this is merely the spectral inverse of the loudspeaker response itself. The loudspeaker is then positioned within the acoustic environment in which it is to be used, and the microphone is placed at a listener position within the environment. An electrical test signal from the test signal generator is supplied to the loudspeaker and the resulting audio signal received at the microphone is measured and stored. The microphone is then moved to another point and the process is repeated. Once sufficient measurements have been taken, the coefficient calculator calculates a room response from a combination of the stored measurements, to be jointly representative of all the points at which the measurements were taken. The coefficient calculator therefore uses the stored model loudspeaker response jointly with the combined measured response to derive the response of the acoustic environment only, eliminating the dependency upon the loudspeaker. A compensation response to substantially compensate the room response is derived, and combined with the loudspeaker compensation response. From the combined compensation response the coefficients of the digital filter to execute the combined compensation are derived and supplied to the filter for use in subsequent audio reproduction. *See Craven, Col 8, Lines 1-22.*

Goff describes a user interface control device, which comprises of five pushbutton keys arranged in a cross pattern, for the control of electronic filter

parameters of an audio spectrum processor. Depression of particular keys or particular combinations of keys can be made to electronically control multiple filter parameters, some simultaneously, for different filter types depending on the filter type. The unique arrangement of the pushbutton keys facilitates operation of the various parameters for bell, notch, shelf, and pass-band audio filter types with a minimal number of control elements and minimal control area. *See Goff, Col. 3, Line 66 to Col. 4, Line 15.*

Staudacher describes acoustic feedback cancellation for equalized amplification systems. A speaker amplification system is described which incorporates an adaptable notch filter that can dynamically adapt to the feedback oscillation frequency and remove it before it is amplified above an audible level. *See Staudacher, Col. 2, Lines 32-35.*

The Claims

Claim 1 recites an apparatus for modifying an electrical audio signal for input to a sonic reproduction device that includes a speaker characterized by a plurality of individual responses which in combination define an overall response for the sonic reproduction device, each individual response comprising at least one of a frequency, time, phase or transient response, said apparatus comprising:

- a plurality of modification filters having modification responses that simulate the plurality of individual responses, at least one said modification filter simulating an individual component of the speaker, the modification filters for receiving the electrical audio signal, modifying the electrical audio signal and providing the electrical audio signal to the sonic reproduction device; and
- a plurality of adjustable parameters, each associated with at least one of the modification filters for allowing adjustments to the responses of the modification filters;

- wherein the adjustments create a plurality of individual conjugate responses, each individual conjugate response associated with at least one of the plurality of individual responses.

Neither Yashima, nor any of the other submitted references, alone or in combination, disclose, teach, nor suggest a plurality of modification filters, at least one of the modification filters simulating an individual component of the speaker.

The Office asserts Yashima for disclosure of "at least one said modification filter (filter 102) simulating an individual component of the speaker (component 4)". *Office Action Dated February 23, 2004, Page3.* The Applicant respectfully disagrees, "[t]ransfer function H2 within block 102 represents the inverse characteristic of the transfer characteristic of the speaker 4 alone" and does not disclose, teach or suggest an individual component of the speaker. *Yashima, Col. 10, Lines 56-58.*

Beginning at page eight of the subject application, an exemplary model of a sonic reproduction device is described as follows:

> [T]he behavior characteristics are defined by individual or groups of individual components of the sonic reproduction device. By modeling the reproduction device's individual components and the characteristics of those components or groups of components, individual compensations for these characteristics can be created and manipulated parametrically. Therefore, these same compensations can be applied to additional systems having similar components or characteristics. *Application, page 8, lines 3-9.*

For example, at page 15 of the subject application a parameter "mechanical resonance" is recited which describes "parts of system including panels, cones, surrounds, and domes". *Application, page 15, lines 7-8.* Thus, individual components of the speaker may be defined "instead of compiling or reducing speaker elements to create a lumped response system". *Application, page 13, lines*

3-4. The modeled individual components may therefore have corresponding compensations which can be applied to additional systems having similar components or characteristics.

Yashima, as previously described, involves an acoustic replay device having a ducted horn disposed on a speaker. *See Yashima, Col. 5, Lines 14-21.* Yashima, however, describes an overall characteristic of the speaker as a whole, as shown in the following excerpt:

> Transfer function H5 within block 201 represents the inverse characteristic of the total transfer characteristic of the speaker 4, the ducted horn 200, the acoustic resistance 300 and the space up to the listening position 5. **Transfer function H2 within block 102 represents the inverse characteristic of the transfer characteristic of the speaker 4 alone**, transfer function H3 within block 103 represents the inverse characteristic of the transfer characteristic of the ducted horn 200 alone, transfer function H6 within block 202 represents the inverse characteristic of the transfer characteristic of the acoustic resistance alone, and transfer function H4 within block 104 represents the inverse characteristic of the transfer characteristic of the acoustic space from the acoustic resistance 300 to the listening position 5. Transfer function H7 within block 203 represents the inverse characteristic of the total transfer characteristic of the ducted horn 200 and the acoustic resistance 300. The coefficient data of the non-recursive digital filter 2 is so set that the non-recursive digital filter 2 has the transfer function H7. *Yashima, Col 10, Line 52 to Col. 11, Line 4 (emphasis added).*

Thus, Yashima merely describes a transfer function **of the speaker alone** and is utilized "so that the effect of the ducted horn can be easily removed". *Yashima, col 5, lines 27-28.* Yashima does not describe individual components of the speaker, but rather describes the effects of the ducted horn on the speaker. Indeed, nowhere in the submitted reference is a filter corresponding to an individual component of the speaker mentioned. Therefore, contrary to the Office's

assertion, Yashima does not disclose, teach or suggest at least one of the modification filters simulating an individual component of the speaker. Accordingly, for at least these reasons, this claim is allowable.

Claims 2-12 depend either directly or indirectly from claim 1 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 1, are neither shown nor suggested in the references of record, either singly or in combination with one another.

Claim 13 recites a sound compensation system for altering an electrical audio signal for input to a sonic reproduction device including a speaker and having associated behavioral characteristic, said system comprising:

- a model of the sonic reproduction device having a plurality of filters that simulate at least one of the behavioral characteristics of the sonic reproduction device, each filter having an associated response that combine to define an overall response for the model, at least one said filter simulating an individual component of the speaker, each response comprising at least one of a frequency, time, phase or transient response; and
- a controller that modifies the response of each of the plurality of filters to transform the filter into a conjugate filter having a response that is conjugate to the original response of the filter.

Neither Yashima nor Narasimhan, nor any of the other submitted references, alone or in combination, disclose nor suggest a sound compensation system for input to a sonic reproduction device including a speaker. The sound compensation system includes a model of the sonic reproduction device having a plurality of filters that simulate at least one of the behavioral characteristics of the sonic reproduction device. At least one of the filters simulates an individual component of the speaker.

The Office asserts Yashima for disclosure of "at least one said filter (filter 102) simulating an individual component of the speaker (component 4)". *Office Action Dated February 23, 2004, Page 6.* The Applicant respectfully disagrees. As previously described, Yashima describes a "[t]ransfer function H2 within block 102 represents the inverse characteristic of the transfer characteristic of the speaker 4 alone". *Yashima, Col. 10, Lines 56-58.* Thus, Yashima describes a speaker as a whole.

Narasimhan does not cure the defects of Yashima. For example, during a training phase described in Narasimhan, frequency tones are transmitted (e.g., via speakers), and then recorded (e.g., via a microphone). *See Narasimhan, Col. 2, Lines 30-32.* Narasimhan constructs a set of inverse filters so the original audio source can then be pre-filtered to product the desired audio output. *Narasimhan, Col. 2, Lines 38-40.* Narasimhan, however, does not disclose, teach, suggest, or mention a component of the speaker. Therefore, like Yashima, the output of the speaker as a whole is measured. Thus, neither Yashima nor Narasimhan, alone or in combination, disclose, teach or suggest "at least one said filter simulating an individual component of the speaker" as claimed in claim 13. Accordingly, for at least this reason, this claim is allowable.

Claims 14-28 depend either directly or indirectly from claim 13 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 13, are neither shown nor suggested in the references of record, either singly or in combination with one another.

Claim 29 recites a sound system comprising:

- a sonic reproduction device having associated mechanical, acoustic and electromagnetic behavioral characteristics;
- a source for outputting an electrical audio signal to a model of the sonic reproduction device, the model having a plurality of filters that simulate at least one of the mechanical, acoustic and electromagnetic behavioral characteristics of the sonic reproduction device, at least one said filter simulating an individual component of a speaker of the sonic reproduction device, each filter having an associated response comprising at least one of a frequency, time, phase or transient response, the model outputting the electrical audio signal to the sonic reproduction device; and
- a controller that modifies the responses of the filters to transform the model into a conjugate model having a plurality of filters with responses that comprise conjugates to the original response of the filter.

Neither Narasimhan, nor any of the other submitted references, alone or in combination, disclose nor suggest sound system having a model of the sonic reproduction device. The model has a plurality of filters that simulate at least one of the mechanical, acoustic and electromagnetic behavioral characteristics of the sonic reproduction device. At least one said filter simulates an individual component of a speaker of the sonic reproduction device.

The Office asserts "at least one said filter simulation an individual component of a speaker of the sonic reproduction device" as claimed in claim 29 is disclosed by Narasimhan at column 2, lines 41-51 as "filters simulate an individual sub-band frequency component of the speaker of the sonic reproduction device". *Final Office Action Dated February 23, 2004.* The Applicant respectfully disagrees.

As previously described, Narasimhan describes a training phase in which frequency tones are transmitted (e.g., via speakers), and then recorded (e.g., via a microphone). *See Narasimhan, Col. 2, Lines 30-32.* Narasimhan does not disclose, teach, suggest, or mention a component of the speaker. In the portion

referenced by the Office, "components" of an audio signal are disclosed, as shown in the following excerpt:

> During the second phase, which is the processing phase for playing back an audio source, the audio source is decomposed into sub-bands whose center frequencies are the frequency tones used for training. In each sub-band, **the audio signal component** is pre-emphasized by the gain using the parameter estimated obtained during training. The resulting signal is then reconstructed into a full-band signal, resulting in an actual audio output signal that is better matched to the intended audio output. *Narasimhan, Col. 2, Lines 41-51 (emphasis added).*

Thus, the "component" in the referenced section of Narasimhan is an "audio signal component" as indicated by the actual text of the section, and is not an individual component of a speaker of the sonic reproduction device as characterized by the Office. *Narasimhan, Col. 2, Line 45.* Therefore, neither Narasimhan nor any of the other submitted references, alone or in combination, disclose nor suggest "at least one said filter simulating an individual component of a speaker of the sonic reproduction device" as claimed in claim 29. Accordingly, for at least this reason, this claim is allowable.

Claims 30-36 depend either directly or indirectly from claim 29 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 29, are neither shown nor suggested in the references of record, either singly or in combination with one another.

Claim 37 recites a method for modifying an electrical audio signal for input to a sonic reproduction device having a speaker and characterized by a plurality of individual responses which in combination define an overall response for the sonic

reproduction device, each individual response comprising at least one of a frequency, time, phase or transient response, said method comprising the steps of:

- simulating the plurality of individual responses with a plurality of filters, wherein at least one said filter simulates an individual component of the speaker;
- adjusting the responses of the plurality of filters such that, for each filter, the adjusted response comprises a response that is a conjugate to one of the individual responses; and
- inputting the electrical audio signal to the filters.

Again, Narasimhan describes a training phase in which frequency tones are transmitted (e.g., via speakers), and then recorded (e.g., via a microphone). *See Narasimhan, Col. 2, Lines 30-32*. Narasimhan does not disclose, teach, suggest, or mention a component of the speaker. Rather, the "component" in the referenced section of Narasimhan is an "audio signal component" as indicated by the actual text of the section, and is not an individual component of a speaker of the sonic reproduction device as characterized by the Office. *Narasimhan, Col. 2, Line 45.* Thus, neither Narasimhan nor any of the other submitted references, alone or in combination, disclose nor suggest "at least one said filter simulating an individual component of a speaker of the sonic reproduction device" as claimed in claim 29. Accordingly, for at least this reason, this claim is allowable.

Claims 38-44 depend either directly or indirectly from claim 37 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 37, are neither shown nor suggested in the references of record, either singly or in combination with one another.

Claim 45 recites a method for altering an electrical audio signal for input to a sonic reproduction device having a speaker and associated behavior characteristics, said method comprising the steps of:

- simulating at least one of the behavioral characteristics of the sonic reproduction device with a plurality of filters, at least one said filter simulating an individual component of the speaker, each filter having an associated response comprising at least one of a frequency, time, phase or transient response; and
- for each of the filters, modifying the response of the filter to transform the filter into a conjugate filter having a response that comprises a conjugate to the original response of the filter.

Neither Narasimhan, nor any of the other submitted references, alone or in combination, disclose simulating at least one of the behavioral characteristics of a sonic reproduction device with a plurality of filters, at least one said filter simulating an individual component of the speaker. Narasimhan describes a training phase in which frequency tones are transmitted (e.g., via speakers), and then recorded (e.g., via a microphone). *See Narasimhan, Col. 2, Lines 30-32.* Narasimhan, however, does not disclose, teach, suggest, or mention a component of the speaker. Thus, neither Narasimhan nor any of the other submitted references, alone or in combination, disclose nor suggest "at least one said filter simulating an individual component of the speaker". Accordingly, for at least this reason, this claim is allowable.

Claims 46-54 depend either directly or indirectly from claim 45 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 45, are neither shown nor suggested in the references of record, either singly or in combination with one another.

Conclusion

All of the claims are in condition for allowance. Accordingly, Applicant requests a Notice of Allowability be issued forthwith. If the Office's next anticipated action is to be anything other than issuance of a Notice of Allowability, Applicant respectfully requests a telephone call for the purpose of scheduling an interview.

Respectfully Submitted,

Dated: 4/22/04

By: ____________________

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